NEWS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: UPON DELIVERY

REFLECTIONS ON GOVERNMENT SERVICE

III. Executive Performance and Its Evaluation

by

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Third of Three Lectures Presented in the
McKinsey Foundation Lecture Series

at the

Graduate School of Business
Columbia University
New York, New York

May 16, 1968

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A recent book on administration, Anthony Jay's Management and Machiavelli, is causing, I gather, quite a stir in management circles. Those given to model building in graduate schools of business and in the inner circles of government are not necessarily responding to the aura of forbidden fruit that the name Machiavelli conjures forth. But Jay's iconoclastic approach, the attractiveness of his thesis, may lie in its myth-destroying directness.

The myth that management as a science -- "appears to have dropped out of nowhere" and to quickly rise to the status of "a new basic institution" -- is not new at all. ". . . it is," Jay asserts, "a very ancient art. . . . The new science of management is in fact only a continuation of the old art of government. . ."

Two things surprise me about Jay's book and its reception. The book, in all fairness, is quite intriguing and well worth reading. Nevertheless, it is strange that anyone in 1968 should view a close kinship between effective management and effective government as novel or as a discovery. Further, I have difficulty with Jay's suggestion that successful management is, after all, only successful politics.

A better way of looking at the matter is that good management is, and always has been, one of the most fundamental requisites of good politics or good government.

Down through the years there have been any number of notable political figures who, beyond a momentary brilliant flash, left little mark on their times, much less on the times of future generations. On the other hand, less striking figures have often made deep and lasting impressions. The difference in many cases seems to be in how well and how effectively the personages in question organized and managed the affairs with which they were concerned.

William the Conqueror, who bears much of the burden of Jay's argument, was far less brilliant as a military strategist, far less of a conqueror, far less of a kingly personality, than any number of those who came before and after him. But he surpassed the others as an organizer and as a manager. He demonstrated this in his inherited Normandy and later in conquered England.

Machiavelli's Prince, if he existed at all, was but one of a number of princes of Italy, only one of a much larger group in Europe. He stood out, even as embellished by Machiavelli, only because of the superior management and organizing qualities attributed to him.

As we in our own time turn toward the use of larger and larger aggregations of power and commit larger and larger fractions of our resources to the accomplishments of great tasks, our own experiences

show that we must have ready and available for use organized ways to insure good and sound management of these enterprises. Complex large scale undertakings cannot be handled ad hoc or haphazardly. The costs are too great, the stakes too high, and the consequences of failure too dangerous.

Professor John Turkevich of Princeton wrote in the April 1966 issue of Foreign Affairs that, "The incorporation of science and technology into society is crucially important to the welfare of the modern state. The military and economic importance of technological developments, their limitless possibilities for good and evil, the inexhaustible demands for funds from the national economy, require immense organization -- for gathering significant information, for making policy decisions, for planning programs, for allocating manpower, for conducting basic research, and for assigning priorities to development and production."

Turkevich was referring to giant enterprises. We here are also speaking of giant enterprises. The NASA program at its peak level has required the service of over 400,000 full time workers in and out of government. Most of these are highly skilled. Many have a high degree of scientific and technical competence. This represents an enormous concentration of human resources. NASA's research and development effort has involved 20,000 contractors, subcontractors, and suppliers within the nation's industrial establishment. Our construction of ground facilities utilized 40,000 workers. We have

spread scientific, technical, and related work among more than one hundred fifty of the universities in this country. Some 8,000 NASA supported professors, research scientists, technicians, laboratory workers, and graduate students are seeking an extension of basic scientific knowledge. We have worked with new and old urban communities to solve problems brought into being in connection with the NASA program. We have had to reclaim wasteland, to construct test stands and buildings of a size and with properties without precedent, to develop new means of transporting huge structures, to carry computer software and hardware to new levels, to work with great industries to bring into being new lines of activity.

NASA, I am convinced, will not be viewed in history as something unique. Instead it is likely to prove a prototype. How, otherwise, can we feel assurance that we can meet the problems of the future, of such areas as a growing water shortage and water pollution? How can we make the oceans better serve a world struggling for more food and other vital resources? How can we meet the other problems of an urbanized society?

An ability to use large scale endeavors when needed is certainly one of the great requirements of our times. To learn how to use them well is a continuing challenge. The essence comes down to extending good management -- sound, effective, and complete management -- into a new and extremely complex dimension.

The problem of management effectiveness naturally begins, and is most acute, in the higher echelons. The executive charged with leadership and the conduct of a large scale endeavor has far ranging responsibilities. He is the main point of impact in the relationship between the endeavor and its environment: In a very real sense he has to represent the environmental factor -- in concrete terms, the Administration in all its facets, the Congress, and the public itself -- within the endeavor; he has to make sure that the endeavor's goals and activities, in all their aspects, are responsive to the requirements and desires of the environment, and under conditions of rapid change and great uncertainty. On the other hand, he represents the endeavor as against the environment. He has ultimate responsibility for securing from the environment the support necessary for gaining and sustaining momentum, for safeguarding against disfunctional forces seeking control and influence, for -- in short -- keeping the endeavor viable and on course toward its goals. He can do none of these outside tasks alone. He must bind associates to his objectives and to his team with bands of steel even though they can hardly understand all the forces that are at work. Meanwhile, the chief executive has to see to it that performance within the endeavor is as it ought to be: that resources are well and efficiently used and that the assigned jobs and tasks are done, and well done, when they should be done.

How can society find executives capable of successfully organizing and managing this kind of large scale endeavor and doing it so as to add strength to our related economic, social, and political institutions?

One thing is sure: we cannot look to any stereotype. At one time we thought we could. Calvin Coolidge reflected a widespread view when he said that "The business of America is business." The prevalent attitude then was that if the government faced a big and complex job, it should turn to those experienced in "getting things done." The "man who has met a payroll" was the obvious candidate. But by now we have learned that membership in a successful business team, even in very big business, is no guarantee of individual success in a large, complex governmental or semi-public undertaking. I say this in no derogatory sense. I say it because of the obvious fact that these undertakings are different from practically all business undertakings. Some business enterprises, and particularly at their creative stage, are themselves large scale endeavors. But many business enterprises are, or tend to become, in some aspects routine. This is so even when they may be staggeringly big.

William S. Knudsen had had a brilliant career in business when he took over the job of directing our industrial mobilization for war in 1941. I well remember the general relief and satisfaction that greeted his appointment. But Knudsen found the requirements of this large and complex undertaking beyond the areas of his experience. And no one has to search far to recall other such situations. There are, of course, examples of great success. Men of the business world have often done extremely well as leaders of special, complex public enterprises. But so have men of other callings.

David Lilienthal was a thirty-four year old lawyer when he became chairman of the Tennessee Valley Authority. General Leslie Groves of the Manhattan District was a professional soldier. Leon Henderson who did what was considered "impossible" with OPA had been a college professor and professional economist.

What is it that has made some men successful in managing large scale endeavors while others with equally impressive backgrounds have fallen short? Has it been some sort of special genius, or has it been a certain way of doing things? This is an extremely important question for research if we are to develop an "organized way" to put to use the large scale approach on urgent problems as we go forward into the future. If success is found to be dependent on the accident of genius, it would mean that an important degree of uncertainty is built into the large scale approach. We would have to ask: How can we ever be sure that a person with the right kind and the right degree of genius will show up at the right time and place? If, on the other hand, the issue is a <u>way</u> of doing things we have an entirely different situation.

We have, as yet, no sure way to figure out what makes genius or how to create it. But we can study the way things get done; we can learn what is distinctive about ways that lead to success; we can systematize them and we can repeat them in an experimental pattern.

Since these McKinsey lectures are intended to reflect my own experiences, and since over the past seven years I have been engaged in administering a large, complex enterprise, I feel that it may be helpful to take a look at some of the things my senior associates and I have done, or tried to do, or failed to do in NASA.

When I was invited to become Administrator of NASA in February 1961, my first answer to Vice President Johnson and President Kennedy was that I was not the right man for the job. This was not a matter of modesty. I would not have had the same hesitation about some other equally responsible task that was not so heavily concerned with the intricacies of advanced scientific knowledge and advanced technology. I had long been interested in science and technology; I had been directly concerned with its industrial application; I had devoted considerable effort and attention to more effective education in these fields. Nevertheless, I was not anxious to assume the responsibility for making the decisions and guiding the actions required in the newly formed NASA.

Nevertheless, both Vice President Johnson and President Kennedy insisted that I take the Administrator's job. This vote of confidence did not change my appraisal of the difficulties of the undertaking. I knew they were still there, and I knew I would have to find a way to overcome them. President Kennedy's view was that the job was not one for a scientist or engineer, but for someone experienced in the broadest aspects of national and international policy.

My first decision was to ask President Kennedy to ratify the appointment of Dr. Hugh Dryden as Deputy Administrator. Dr. Dryden and I then decided to ask Dr. Robert C. Seamans, Jr., to remain as Associate Administrator with responsibility as general manager of operations. My thought was not that I could thus effect a smooth transition during which I could "learn the ropes." I knew Dr. Dryden and Dr. Seamans to be broad-guage men of proven worth and with experience in several areas basic to NASA's needs. I felt we could develop work habits that would enable each of us to help the other two grasp the totality of the whole job that NASA had to do and that we could then proceed to do it together.

Dr. Dryden, Dr. Seamans, and I immediately set to work to end the uncertainty that had prevailed for several months, to make clear our support for the manned space flight program, to define necessary additions to the budget (for Fiscal Year 1962) that had already been sent to Congress by the outgoing administration, and to establish personal and official relationships conducive to effective group leadership. The three of us decided <u>together</u> that the basis of our relationship should be an understanding that we would hammer out the hard decisions <u>together</u> and that each would undertake those segments of responsibility for which he was best qualified. In effect, we formed an informal partnership within which all major policies and programs became our joint responsibility, but with the execution of each policy and program undertaken by just one of us. This meant

that everyone in and out of the Agency knew all three of us would certainly be involved in major decisions; that with policy established, the orders for its execution could be issued by any one of us; and that, while NASA had an Administrator as a single point of final decision, to the fullest extent possible, we would act together. From my point of view, and I believe also from that of Dr. Dryden and Dr. Seamans, this was a most happy and productive relationship. In every major matter, we worked intimately together to establish a sound foundation for our policies and actions. Each of us helped to bring capable and valued associates into positions of responsibility. When one of us found the burden of his work too heavy, the others stepped forward to share it.

One of the important benefits from this arrangement was that it enabled us to lay out our plan of organization and administration for the initial period so as to enable Dr. Seamans to maintain a single point of close control over the Agency's resources; and so that major personal contacts between senior officials in Headquarters and in our decentralized Centers would run directly through his office or be subject to his supervision. At that time with quite a few strong-minded individuals already established in important places both in and outside NASA, it was important that his central position as general manager of our activities be clearly understood and his effectiveness in that position assured. Since he, Dr. Dryden, and I were in constant contact,

the three of us viewed this arrangement as the best way to provide a single official and personal focal point for execution of our joint decisions. This way we could take all actions necessary to make sure that basic research and the resource base of the Agency would keep step with the expanding development programs. This way the three of us could participate directly (without an intervening layer of management) to ensure a continuing evaluation of the performance and growth potential of our senior personnel.

An additional purpose was to create the kind of flexible organizational and administrative framework within which the procedures used and the responsibilities, even of quite senior officials, could be readjusted without embarrassment, or great difficulty, or major internal struggles. We wanted to begin our expansion in an environment within which people would not be frozen into rigid assignments, and through which the three of us could take a series of actions to foster an atmosphere at senior management levels of readiness to accept change in organization and duties.

Our initial purpose was to maintain this fluid status until we could form our judgments as to the capability of the men on whom the major responsibilities would rest and had stablized a pattern that would enable us to make a proper division of the workload. We wanted enough time, in a quite fluid state, to make a more permanent match of the men with the work assignments, which were themsleves rapidly expanding.

Our concern was born of a very pressing consideration. We knew that our effectiveness at the Administrator's level was dependent upon the effectiveness of key executives throughout the operation, and we wanted to maximize their effectiveness from the very first.

This brings us to a key area in the management of a large scale endeavor: the all important area of the executive within the organization.

To say that the higher levels of an organization are dependent on the lower levels is to belabor the obvious. But obvious or not, it is frequently too little emphasized. Key executives within an organization have to see to carrying out the policies and decisions from above. They have to complement and supplement these on their own. They have to provide feedback and judgments.

If the executives down the line are good at all aspects of their jobs, the chances are that the endeavor will succeed. If one or more is deficient and remains in place, the endeavor may have difficulty. If many are deficient, or even merely adequate, the endeavor may be in real trouble. This is true in today's world for any operation of any size -- public or private, product-oriented or service-oriented, routine or special. It is particularly true for the large endeavor which is so complex that those at the top cannot have detailed knowledge and expertise, or be in a position to keep abreast of many

facets of the operation. Furthermore, the large scale endeavor is particularly subject to unpredictable forces and newly seen opportunities. The main task of leadership is one of continually organizing and reorganizing, directing and redirecting diverse human and material resources and complex activities under fluid conditions. The process of management in the large scale endeavor becomes that of fusing at many levels a large number of forces, some countervailing, into a cohesive but essentially unstable whole and keeping it in motion in a desired direction.

Executives within such a large scale endeavor have to be different. They cannot function in accord with the simplified scheme of traditional enterprises. Take, for example, such traditional principles as "well defined areas of authority and responsibility;" "unity of command;" "one man, one boss;" "unity of direction;" "one objective, one plan;" "compensation commensurate with contribution;" "centralized operations;" the "Scalar" unbroken line of command; "a place for everything and everyone, and everything and everyone in its place;" "stability of tenure, no unnecessary turnover." Such principles might work well for the static organization, but more is needed for the dynamism required for a successful large scale endeavor. The executive trained only in such traditional principles, able to operate only in accord with them, and uncomfortable in their absence would be of little use and could expect little satisfaction in a large complex endeavor. So

too, in all frankness, would the executive who has to be psychologically coddled in the fashion that the participative school of management advocates.

In the large scale endeavor we have to have a special sort of man for key executive positions: one knowledgeable in sound management doctrine and practice, but who can do a job without an exact definition of what it is or how it should be done; one who can work effectively when lines of command crisscross and move in several directions rather than straight up and down; one who has, and is himself, several bosses at the same time; one who can work effectively in an unstable environment; who can live with uncertainty and a high degree of personal insecurity; one who can make do with less of a monetary reward than he could insist on elsewhere; one who can blend public and private interests in organized participation to the benefit of both.

More than anything else the executives within a large scale endeavor must be able, one-by-one and together, to see and to understand the totality of the job the endeavor is designed to do. Each must see and understand the relationship of his evolving and changing individual assignment, and of the functions and people involved in that assignment, to the whole job and its requirements. This involves more than knowing his place and his responsibilities within the organization itself; or knowing the organization "upside

down." It involves an awareness of the relationship between the total job as it exists at that time and his own particular job within the total, including the elements of the environment which are so much a part of the total. He must be able and willing to adjust his own work and the work of those associated with him to the needs of the totality. He must be able and willing to forego use of his position for "hobby-shopping" in accord with his own interests and his own individual judgments as to what is "most important." He must be willing, when necessary to get the total job done, to assume responsibility for decisions and judgment of others, even when he would have it otherwise. He must, in short, perform 100 percent of what is needed and expected of him, not 100 percent of what he may feel he should do, could best do, or would like to do. At the same time, and despite a seeming contradiction, he must know when to make an exception to limitations that formalistic requirements have placed on him, and individually or with others to generate "pressure" for a change in course, an advance, or to overcome a difficulty that otherwise would limit progress.

How does society find executives of the type needed in large scale endeavors and provide management of the kind that will encourage them to do not only their own jobs well but contribute to the dynamism so necessary for the whole undertaking? How do you judge an executive's performance; whether he is a source of great strength, a liability, or only adequate? How do you select from among executives those to be

entrusted with greater responsibility? How do you insure that your management system will prepare executives for larger responsibilities? What criteria do you use to "select out" executives who are deficient or show insufficient promise? How do you get rid of an executive you cannot fit in? These are very basic questions. Where are the answers? Does management doctrine suggest the answers? We have to say: "no." Even with routine endeavors, doctrine backs off where such key executive problems arise. Its standardized guides involving such things as "experience profiles," "matching the man and the job," and evaluation by "return on investment," etc. are inadequate for the large, complex endeavor.

My own experience is that just as the large scale endeavor requires executives of an unusual type, it must be so internally designed and structured as to enable executives to perform in an unusual way. When I took the oath of office as Administrator of NASA, I stated to the assembled officials that my purpose would be to work toward an environment within which the Agency could be as innovative in the management of all its activities as it was in its scientific and technical work.

If the organizational framework in which executives are fitted is rigid, the executives can hardly be flexible. Since the endeavor itself must be able to maneuver in a turbulent atmosphere and to maintain its flying speed when buffeting is severe, the elements that make up the endeavor must in their turn be responsive to quite flexible controls.

This is not to say that the formal organizational structure and standard operating procedures are unimportant in a large scale endeavor. New and disparate as are the interests and activities in NASA, the elements of our organization chart are not greatly different from those of other endeavors. We have an Office of the Administrator with appropriate elements, including an Executive Secretariat; we have a central staff set up by functional specialties such as policy and planning, external affairs, legislative affairs, and international affairs; and we have an Office of Organization and Management that includes offices for industry affairs, university affairs, controllership and budget, personnel management, and audit and inspection. All three of these are grouped under senior executives who guide and represent the integrated interests of their respective sectors of the organization. We have four separate program offices where the planning, direction, and control of our research and mission activities are centered. Each program office is specialized, but covers a broad area: Research and Technology, Manned Space Flight, Science and Applications, and Tracking and Data Acquisition. These offices also have major responsibility for the utilization of our geographically dispersed research and development centers and field stations where 30,000 of our 32,000 civil service employees work and our $4 billion capital plant is located.

Every executive in the Agency has a place on the appropriate organization chart, which shows his superiors, his subordinates, and the place his functions, responsibility, and authority occupy in the total of the Agency. Management instructions are issued regularly to designate the methods and procedures whereby executives function on specific matters. In NASA, a large area of authority is placed on the Administrator by law, but wherever and whenever possible, it is my policy to delegate to an appropriate executive the power and authority to take action, on his own authority or under my own. In the latter category, it is his additional responsibility to insure an adequate feedback to me as to how he is using his delegated power.

We all know that even top level executives have to conform to "checks and balances" that are required throughout an organization. They must make formal reports; provide information about activities and the operations on a regularized basis; conform to established reviewing and clearance procedures; share in various group activities; submit to internal audits; and in a public endeavor subject themselves and their operations to procedures required by the Bureau of the Budget, the Civil Service Commission, the General Accounting Office, Congressional committees, special data collection agencies, and interagency coordinating groups. In the fast-moving areas requiring real-time decision making, as in the case of an abort action if a spacecraft fails to achieve orbital speed, we in NASA combine much

of this "check and balance" concept into what we call "over-the-shoulder supervision." However, it is more than that. It is a kind of participative and collaborative judgment-forming process with up to four levels of hierarchical authority involved, frequently in a simultaneous effort to draw valid conclusions from a large body of complex incoming information.

I have known executives who chafe at these kinds of requirements on grounds that they represent "red tape," take too much of their time, and "dilute" their capacity to make the "main effort." I have also noted Behavioralist studies that show middle executives generally anxious to be relieved of "red tape" controls, requirements for reports, and other such things in order to concentrate full time on "constructive" elements of their jobs, and on which they expect to be primarily judged. The large complex endeavor cannot allow the executive such freedom and personal choice as to which parts of the job he will not be bothered with. Activities that may seem to one person as routine are as essential to his effectiveness as many other more appealing activities. As much as anything else, work habits on ordinary day-to-day matters frequently make or break an endeavor.

A harsh case in point, as seen by hindsight, was the tragic fire at Cape Kennedy in January 1967. Within our feedback system and at several executive levels certain trouble signals for the Apollo capsule development and test effort began to appear. But none of these was so strong as to be singled out and acted upon as vigorously

as they should have been. Everyone felt sure our research and development system and that tried by our contractors had solved worse problems before. No need was felt to feed these into the mainstream of Agency decision making in such a way that corrective measures would be insured. Many actions were being taken every day in the steady stream of decisions and problem-solving required for a complex development project and the nature or severity of these signals did not seem very different from the others flowing in the system. Our project managers had almost always handled such matters in the past. The result was a great failure, and a very costly failure. Its origins lay not in the lack of creativeness or brilliant insight on the part of our engineers, project managers, and executives, or in an inability on their part to do all of the things required for success. The shortfall was in the area of management supervision and insistence on the full dedication of all of them to making every part of the prescribed system work, with exceptions fully evaluated, approved, and put into effect only in the prescribed ways.

Professor James Fesler of Yale University in the letter I read from in my first lecture remarked that while "older doctrines seemed oriented to a stress on orderliness and stability, an important new emphasis is on how to organize, staff, and design procedures that will foster innovation; the supposition is that innovation is a more important goal than the stability that is instrumented by the kind of bureaucracy sought by traditional doctrine."

As I read the management literature of today, it seems to me that a common fault results from an either/or complex. Why is it necessary to have a conflict, such as Professor Fesler describes, between "orderliness and stability" on the one side, and "procedures that will foster innovation" on the other? In the large scale endeavor we must have, as I have emphasized, the orderliness and stability necessary for exactness and continuity in operations; we cannot have key executives going off in directions of their own choosing and making their own rules as they go along. On the other hand, we must have work habits and procedures that will foster innovation, for without innovation we cannot possibly organize ourselves to accomplish these large, complex, and demanding jobs. In both the areas related to "orderliness" and to "innovation," some combination of leadership evaluation or supervision is a necessity. With skillful inclusion in the system of "self-policing" features, supervision can more nearly take the form of leadership.

It is a little understood fact that in a large, complex developmental endeavor, administrative uncertainty has to be taken into account just as does certainty. No one can know in advance all that will be required either for the whole job or for particular jobs within the whole. We can regularize and thus help make certain a large percentage of it--up to seventy or eighty per cent. But the balance--the remaining twenty to thirty per cent--can only be defined as the job is actually done.

When the NASA program began, we knew many of the research and development needs we would have to meet and had sound ideas as to how to meet them. We knew we had to have a booster with a lifting capability many times that of the largest booster then available. We knew that if we were to send men into space and bring them back safely, we had to have a new kind of spacecraft, one capable of providing its own life support system and one that could re-enter the atmosphere without subjecting the astronauts to higher temperatures and deceleration forces than were known to be safe.

It had to be safely landed and recovered at some pre-arranged target. We knew these and many other things, and the state of our scientific and technological competence was such that we could go ahead and start work on them with assurance that they could be made to work. But there were other things we could not know with any degree of certainty. There were important areas of unpredictability, areas where none of the experience of man could tell us what would be needed or how it could be provided. Yet we had to go ahead despite these uncertainties. The only way we could learn was to do.

What was true of the NASA job as a whole was true of the key jobs within NASA. Seventy to eighty per cent of each job was defineable; twenty to thirty per cent was not. In the area of uncertainty, the executive would have to find his own way. Nobody could tell him precisely what to do; there was no precedent to which he could look; there was a blank area in his job description. This part of the job was up to him. And this part of the job, it goes without saying, was

an all important part. Performance here was the key to the success of the executive. The sum of these parts was also the key to the success of the whole endeavor.

If instead of a manned exploration of the moon, President Kennedy had chosen as the nation's goal the building of a large earth orbiting space station, we could have adjusted the size of that station downward should there be a shortfall in booster thrust. If we had had to make one or more such adjustments, we would have been subjected internally and externally to all kinds of questions and pressures relating to whether the goal of preeminence in space was actually being met. We would have faced a particularly difficult kind of credibility gap in an endeavor whose real purpose was to build a national capability to operate in space and to develop a variety of options, any of which could be utilized by the nation in the event of future need. But the goal chosen by President Kennedy, manned exploration of the moon, required a full and complete success in the development of a booster large enough to do the entire job as well as the spacecraft and operational know-how to send the men out and bring them back. Even a small shortfall in booster performance could only spell failure to meet the goal. There could be no yielding to temptations to downgrade the objective when difficulties in meeting it arose.

Many otherwise thoughtful observers have failed to recognize this important characteristic of the 1961 space decisions and have also failed to recognize that the capability to land men on the moon imposes

the requirement to develop and use energy up to ninety-eight percent of the total required to do any other job in space. The same booster that can take men to the moon and bring them back can put the same class payload into synchronous orbit around the earth -- a particularly difficult but important capability which this nation now has and very likely would not have if any goal short of the moon had been selected in 1961.

The lunar landing goal required us to accept elements of technical uncertainty, but it also gave us assurance that its achievement would eliminate uncertainty as to our national space capability.

In recent years a myth has grown up that with modern management tools -- and particularly those associated with the computer, the techniques of systems analysis, and a "cost effectiveness" approach -- areas of uncertainty can be largely eliminated within even the most complex of undertakings. The assumption behind the myth is that goals and sub-goals, and present and future requirements to meet these lend themselves "to reasonably precise calculation" through the use of such modern tools. Any endeavor, the concept has it, can be cast in the mold of a system of measurable units and dimensions, and into this system all component programs, projects, and activities can be fitted with high precision. Management can then go forward as mainly a mechanistic process rather than as a thoughtful and discretionary function. Given at the top a small team trained in the use of modern scientific management tools, sets of directives

can be worked out which can be carried out by executives up and down the line and will thus insure all needed results, and incidently only needed results.

There can be no doubt that the development of the computer and computer science has enormously increased our capabilities to manage complex things. The oft-abused term "revolution" is applicable here. And the development and refinement of the systems analysis approach, to which the computer has contributed so much, has certainly been significant. Many of our most successful large scale endeavors would not have been possible without these tools. Certainly they have been essential in the management of NASA.

Any idea, however, that these tools can give us a mechanistic way to manage large and complex enterprises is fanciful in the extreme. The fallacy is that the dimensions of a system and its requirements can be determined in advance of a clear understanding of the conditions under which it will have to develop and operate. It leaves out of account the all important environment which is a real part of the endeavor itself. I look back with dismay at what would have been the consequences if NASA had settled upon all the elements of our requirements in space on the basis of the knowledge and understanding we had in the late fifties and early sixties.

To fix upon a course for a large, complex enterprise without providing means to enable adjustments in consequence of turbulence, change and unpredictable quantities in the environment in which it is to go forward would be to court disaster. The French military

establishment determined well in advance of the Second World War the strategic requirements to insure victory, and acted accordingly. It just happened that the war that came did not conform to their calculations.

The executive in charge of a large, complex endeavor must make allowances for the area of the unknown and the indeterminate. In what he himself does he must apply what I have called an "Administrator's Discount." And he must so organize and conduct operations as to make possible a similar allowance on the part of his key executives. He must avoid rigidities in the organizational structure. He must leave to key executives areas of choice and grant them sufficient authority to make the best use of their own judgment and competence in these choice areas. He must allow them opportunities to innovate and improvise. More than that, he must keep them under a judicious level of pressure to develop and employ their capabilities to act on their own. He must devise techniques to help them to see the totality of the job being done and the relationship of their particular jobs to that totality, and then to dig deep down into all their inner resources and to bring those resources to bear in effective ways to help get the big job, the total job, done.

One of the things we must realize is that most executives who fail in key places in a complex endeavor do so because they are unwilling or unable to think through the totality of the job they are expected to do and the actions they must take to succeed.

They sometimes drift into that part they like to do. They often get pulled and hauled around by outside influences, or they become prisoners of people around them whose interests lie with the particular rather than the whole. Sometimes, they simply refuse to believe that anything can be more important than the personal goals they have set up for themselves.

I would say that the greatest part of our management leadership effort in NASA is directed toward helping executives, on the one hand, to learn to act on their own initiative, and, on the other hand, to keep their initiatives within the bounds of the needs and responsibilities of NASA's total job. We seek brilliant executive performance in the conduct of each of our projects and programs. But we do not want brilliance to become an end in itself. We want it to make a one hundred percent contribution to the whole of the endeavor in which we are engaged.

In more concrete terms, we expect the key executive to recognize those decisions he can and should make and to act upon them in consonance with prevailing Agency values, policies, goals, and objectives. Consideration of the primary impact of the decision, the resources required, and like matters is of utmost importance. The <u>way</u> the executive elects to form his decision is critical -- based on his knowledge, consultations with the right senior associates (up, down, and across organizational lines), utilization of unambiguous feedback and reflective consideration of broad sets

of organizational aims. Such decisions as he clearly should pass upward and those that may impact future or higher level decisions should fall in a category where the executive becomes a good staff man -- seeing that a full and complete presentation of the facts, projections, and implications of the decision (as he sees them) is made quickly available to the higher authorities. There should be no effort to insist on his "single preferred approach." A really good executive will learn to organize for, and act upon, such upward-moving matters as a habit of work.

These all important work habits usually become visible early in an executive's career and can serve in some cases to judge his ability to move higher in the organization. How well he draws the dividing line between his prerogatives and his responsibilities to higher authority is one aspect of that undefineable something which separates the outstanding from the good. Another is his ability to accomplish multiple objectives simultaneously, and his ability to organize and train his staff to support such actions.

To get the sort of executive performance you have to have in a complex endeavor like NASA, freedom and individual authority must be placed more on a man than on a "position." Evaluation and supervision must run to the man, not the position. Delegations to a position without regard to who occupies or may occupy it can tear down the best system of checks and balances. The executive must himself merit

a continued delegation and freedom of action. He must maintain the confidence of his superiors through a variety of means. He must demonstrate the ability to deal effectively with a wide variety of people, some of whom are highly skilled scientific, engineering, and administrative specialists. He must be able to work with people scattered geographically and often serving more than one operation and more than one boss. The creation of effective channels of communication under these circumstances is essential for such an executive to keep his responsibilities in hand. He must practice self-discipline and insist on, not just tolerate, the organizational discipline represented by self-policing systems for both the areas of substance and those of administration.

How the executive establishes, maintains, evaluates, and utilizes the feedback from his activities is crucial to the accomplishment of the goals of the large scale endeavor. Mr. John J. Fendrock in the March-April 1968 Harvard Business Review wrote of a sobering case history where key executives failed in their responsibilities. The article, entitled, "Crisis in Conscience at Quasar," illustrates the danger of a feedback system that is not self-policing. The incident dealt with represents something of a nightmare for every chief executive: an incident where trusted associates are so deeply committed to a line of action they have decided upon that they begin to cover up and buy time for a hopeful but increasingly remote solution in order to avoid loss of face in the organization.

In the early days of NASA, Dr. Dryden, Dr. Seamans, and I as its senior management group were determined to build a management system that would emphasize the importance of first-class performance and individual competence at each level of organization. We attached high importance to the development of competence in all phases of administration as well as in the scientific and engineering disciplines, and other specialties. Our policy was to utilize and emphasize patterns of administration that would foster a pervasive development of careful judgment as an almost instinctive approach to important problems by all key personnel.

An illustration of this lies in the important field of contractor selection and procurement procedures. Here, Dr. Dryden, Dr. Seamans, and I determined that we would personally examine, in detail, the results of the work of all Source Evaluation Boards on competitively negotiated contracts that amounted to five million dollars or more. These Boards were required to appear before us personally in a formal setting and make a full and complete presentation of (1) the method chosen to break down for evaluation the contractor proposals, (2) the numerical values which summarized the results achieved in the application of this method, and (3) the judgment of the board on each of the categories of the breakdown. The effect of this systematic approach to a continuous emphasis on the judgment factor has been that for seven years, on innumerable occasions and for extended periods, the three senior officials of NASA have sat side by side and personally

examined in detail, and tested by question and answer, the quality of the individual and collective contributions of the members of these Boards to major decisions affecting the choice of contractors, an area where ninety percent of our resources are expended. We thus formed our own personal judgments, based on a great deal of personal involvement, as to the validity of each Board's findings and of the process itself.

We deeply immersed ourselves on a daily basis in a complete analys s of the main factors, within NASA and at the plants of our contractors, on which our projects depend for success, and the views, approaches, and analytical judgments of our senior personnel. In this process we were able to observe and evaluate how rapidly the organization and its contractors were developing their capabilities, and how effective our effort to get nine-tenths of NASA's work done by contractors was proving. We believe this constant and visible personal contact among NASA's senior officials and other responsible personnel involved in the hard problems and decisions in procurement provided a great deal of stimulation, motivation, and innovation throughout the organization.

The fact that the senior officers of the Agency would take the time to conduct what amounted to a thorough hearing and question-and-answer period on each contractor selection action enabled all levels of management, in Headquarters and in our Centers, to get their questions out on the table before all three of us for debate

and clarification. Another important result was that when the presentation to the three of us was over, everyone involved had a clear understanding of the elements basic to a proper decision and everyone in NASA concerned with the matter was aware of this. The burden then passed to Dryden, Seamans, and myself to make the final decision, and the personnel of the Boards were in a position to form their own judgments as to whether the three of us did in fact arrive at the best decision as indicated by the facts and analysis. An important element of a NASA-wide and pervasive self-policing system was thereby established. This has had an important effect on maintaining high standards throughout the Agency.

One of the things we have felt it most important to do in NASA has been to encourage executive development through constant "upward pressure." We have followed wherever we could the practice of deliberately assigning our executives to jobs outside their normal range of experience and beyond their demonstrated competence. Our object is to challenge under firing-line conditions the ability of the executive to perform at a higher level. Such purposeful shifting of personnel to new and more difficult jobs -- and an often accompanying process of trying out a new organizational concept -- might be characterized as a form of "designed disequilibrium." Through it both weaknesses and strengths in the executive group are surfaced, as are also many organizational deficiencies and needs.

The practice is a tough one. It can be hard on the individual who suddenly finds himself out of a familiar groove in which he has been doing quite well and into a new and trying situation where he has to struggle to keep his head above water. It can also be costly to the Agency in that executives who have been found adequate may be throughly inadequate in the higher job. I believe, however, that these are fair prices to pay for continued development of strengths, for removal of weaknesses, and to identify executives of the highest quality.

The value of such an approach is sufficient in my mind to justify consideration of a system of "selection out" of the lowest ten percent of our 200-odd project managers each year even if they are judged adequate on the present job. Such a process would keep a systematic pressure on the system from the bottom up, forcing identification of the managers capable of handling any complex program, whether the Apollo project, the Manned Space Flight program, or my own job as Administrator.

Another side of the matter is that in a complex endeavor the situation is too fluid to permit the fixation of either jobs or people in jobs. The nature of tasks and demands change too rapidly for a static setup to be effective.

The management structure in NASA is still evolving and will necessarily continue to evolve. For a long time it will remain anything but static. The fact that contracts are administered on

a decentralized basis from widely dispersed Civil Service contract administrative organizations has introduced the requirement that contract officers, supported by professional staffs of attorneys, accountants, auditors, and inspectors, must also work with project managers and large numbers of scientific, engineering, and other technical specialists not under their direct administrative control and vice versa. Further, the necessity of operating a wide variety of complex programs as a coherent whole with internal balance in each has meant the establishment of thorough-going management systems for financial, technical, and schedule reporting with critical-path analysis and configuration control. These systems, as I have said, covered work at one point involving over 400,000 men and women and some 20,000 prime and first- and second-tier subcontractors. The magnitude of this undertaking and the significance of the methods by which the administrative problems were solved, it seems to me, to be more clearly deserving of close study and research.

We have used other devices than those I have mentioned to secure the sort of performance we need from our executives. One I believe particularly worthy of note is the practice of making executives responsible for the presentation of their programs before Congressional Committees. Our practice is for the Administrator to present to the four Congressional committees which must approve our programs the broader aspects of the whole program and the key policy points related to the annual budgets. Program executives and their key

staff personnel then present the detailed program aspects for which they are responsible on a day-to-day basis. We consider that the expertise and effectiveness of these executives in portraying their needs and the results of their operations as well as the relationships between those operations and the total job being done by NASA is the key element in justifying the expenditure of public funds and in Congressional attitudes toward the Agency. We believe the Congress must see these men, must understand how they operate, and have confidence in their abilities as responsible stewards of public funds. And we think this responsible relation between them, in open sessions, and the Members of Congress makes them better executives.

One of the great difficulties about executives in a special complex endeavor is that from the career standpoint its vistas seem limited. The demands on such men are almost unlimited and tend to grow in direct ratio to the man's effort and effectiveness. They can in fact be literally killing. The rewards, on the other hand, are limited. There can be little future in the job, since the whole business often looks toward getting something over and done with. The chances of being weighed and found wanting are great. Meanwhile the type of people we need are naturally in great demand in other areas. They are "premium" people. Evidently few people recognize how much difficulty an agency like NASA has in bringing high-level executive people in from various backgrounds and fitting them into our organization, letting each serve in such a way as to

derive satisfaction while serving the organization and then either remaining or departing depending on his personal desires or performance. Few recognize, for example, the importance of the decision we took and the follow-up management ingenuity that was required to create in our Office of Manned Space Flight a group of men not only dedicated to NASA's program but also who could have the full confidence of the Department of Defense and the Air Force. Similarly, few recognize the importance of our creation, during that same period, of the managerial competence that put into effect the extremely difficult and complex all-up systems test concept that is now showing its value in the successful Apollo flight tests.

Another of the great difficulties in the executive area for a large scale endeavor is that of choosing men of real promise for particular jobs. You cannot use a computer for something like this. You cannot use standardized formulas. When you are looking for special talents you must use special ways to find them. The problem is: what special ways will work? After many years of experience in seeking top flight executives for many difficult tasks, I must confess that I know of no sure way. The best I can offer is a set of principles that add up to a little more than systematized trial and error.

The most important of the things I have learned about the selection of key executives is to find someone fully worthy of trust. If you do not know of such a person yourself, which of course is often the case, turn to someone you do know in whom you have trust to suggest

a person that he knows and in whom he has trust. After that, do as much homework on the man as possible. The most important thing, I believe, is to get as much information as possible as to his character and integrity as well as his experience. This, of course, is basic to the trust you must have in him before an effective working relationship can be established.

Men who have demonstrated great achievements in a solitary field can rarely break out and broaden their vistas. Those who have succeeded at numerous specialties, on the other hand, represent a source of top executive material much more prone to success than the top specialist in his field.

When a replacement is needed, there appears to be little use in attempting to select scientifically an executive through a long period of complex matching and testing schemes. In some of my earlier experience I spent months seeking the "just right" key executive for a job. But I have found that such approaches can be counter-productive. When you put that much effort into a selection and persuasion process and a man fails, you are committed to the man. Furthermore, it seems that the failure rate is not greatly lessened by such an arduous process. Today, I search until I find a man who seems to be qualified and put him immediately to the test. If he works out, fine! If not, I try another.

Reliance must also be placed on a continuing on-job evaluation process. This is true even in the cases of "proven" performers whose success record speaks clearly to all who will observe. It is unfortunate but true that just as men's work and living habits grow and improve and mature as they advance, a point in time all too frequently comes when the tide begins to flow out, when the habits deteriorate or cease growing to meet the changing times.

Management literature details many ways to evaluate performance for the routine-oriented or profit-centered operation. There is much less, however, that fits the requirements of the large scale endeavor in which the job is not easily definable. The profit-center concept can and should be applied to a degree in evaluating any executive, since every executive has a responsibility to get a basic job done which is subject to some measurement of results. Those who cannot produce must be replaced just as an army commander who continually loses too many troops in battle must be replaced. The same goes for the group vice president who cannot match his associates' profit statements. But acceptable or even outstanding performance under this evaluation technique is not enough. We have the much more important matter of an executive's contributions or lack of it to the way new and improved capabilities and effectiveness in his working relationships with those elements in the operation beyond his immediate span of control evolve. This can include customers, the universities, Congress, various Government agencies, industry, and others.

A first step beyond the "profit and loss statement" -- or for NASA the mission success or failure record -- is, of course, evaluation of supporting activities required to achieve these things, i.e., budget performance, production schedules, logistics plans, inventory maintenance, quality control, research emphasis for product improvement and new product development, etc. Areas such as these produce the massive volume of data I spoke of earlier, which in turn feeds the program evaluation and executive evaluation process as well as performing its primary purpose as an essential element of program implementation. How an executive uses this feedback to identify problems, to effect needed shifts in emphasis, to secure improved methods, etc., are, of course, large measures of his capability and are observable in the feedback data itself.

Going further in the evaluation process, greatest importance must be attached to the executive's basic work habits. These are, of course, not amenable to evaluation in quantitative terms nor by a mechanical approach. In this area of evaluation, the very personal, almost intuitive processes come to bear. What is involved is a measurement of differences. In the rigid, hierarchical organization there may be little need for emphasis on this area because in most cases the system prevails and the man conforms or leaves. In the flexible organization subject to the disequilibrium of change and the unpredictability of the future, differences in work habits become highly significant.

The executive in the dynamic situation must rely on his basic capabilities to perform -- he cannot rely on the standardized, time-proved approaches. He therefore exposes his thought processes and his work habits as he searches for needed solutions. Certain fundamentals of organization and procedure also provide continuing opportunities for executive evaluation in these areas of work habits and thought processes. The concept of the central functional staff, which has been long argued regarding organizational efficiency as it pertains to accomplishing the primary job, is first a method to restrict operating arms from becoming too parochial and overlooking second- and third-order benefits. Most importantly, in consideration of the question of executive evaluation, however, the central functional staff forces key executives to seek assistance from beyond their sphere of direct control in order to accomplish their main work effort. And, of course, the executives of both the operating arm and the staff arm must become familiar with the problems and approaches of their opposite numbers. This forced interfacing provides more visibility to the senior management leaders as to the way in which each of the executives is functioning to accomplish his job than is the case when the operating arm possesses all the needed functional staff expertise to accomplish its job autonomously.

The key executive is also subject to evaluation by those beyond the organization with whom he must work. Just as my two senior associates and I observe the functioning of NASA executives at Source

Evaluation Board meetings where we are evaluating the evidence related to large contract awards, various Congressmen, industrialists, and university officials, etc., observe and judge the performance of the three of us and many other NASA executives in a variety of situations in which I and my senior associates can rarely observe them. Their successes, their failures, how they conduct their business, the way they represent the goals of NASA, and the values placed on methods of implementing plans to reach goals are portrayed in these contacts. From these outside observers come impressions that add importantly to the evaluation process, and thus feed-in from these outside sources is an important ingredient of judgment.

What I have so far been addressing is evaluation on the basis of the balance sheet or mechanistic approach, on the one hand, and first and second hand observations on the other. The shortfalls of the former approach for the complex endeavor are obvious, while reliance on observations that depend so much on memory and intuition have been extensively belabored in management literature. There is need therefore for an acceptable compromise or gap filler to fit between the quantitative "results measurement" and the nonquantitative "observational evaluation."

To my mind the complexity, the unavoidable impact, and the broad range of a key executive's job in a large scale endeavor forces the use of and heavy reliance upon the "conventional" interview. If an

administrator is squeamish about expressing judgments regarding his senior associates or to hand out rewards or reprimands, then that administrator should stay away from large scale endeavors. In work of the size and scope and subject to the complexity and unpredictability of such massive undertakings, there can be no substitute for plain talk between the highest executives.

It is my current practice to meet privately once each week with each of NASA's top eight executives for an hour of face-to-face structured discussion which amplifies and expands the feedback process that has been continually going on between us. Inputs from all sources may be brought into focus in these meetings where no holds are barred. There are no intermediaries and no mechanistic approaches with agreed ground rules. There are just two men, each charged with a great deal of responsibility and vested with substantial powers, sitting face-to-face, discussing problems, possible solutions, and how we personally and our other associates are actually performing in light of these. These are not staff meetings; we have staff meetings too. The face-to-face evaluation and discussion meeting is a penetratingly personal confrontation on matters which neither I nor the executive involved would want to bring up in meetings with broader attendance.

One distressing problem in managing key executives in large scale public endeavors comes when a top "career" executive proves inadequate for his current assignment. Not only must the administrator

respect the inherent value of the individual and the value of his prior performance, but he must also consider Civil Service regulations.

In this last regard NASA is the beneficiary of a farsighted provision of the Space Act of 1958. This legislation, as amended, vests in the NASA Administrator the authority to "appoint and fix the compensation of" over four hundred "scientific, engineering, and administrative personnel. . . without regard to /Civil Service/ laws." The Administrator thus not only has a free hand to recruit, appoint, and fix compensation for this number of key executives; he also has unilateral power to dismiss, demote, or transfer those so appointed. The only restrictions relate to veterans preferences which require advanced written notice and justification of any adverse personnel action.

This was a breakthrough in terms of the number of such "excepted positions" made available. It has enabled us to atract and to use as needed specially qualified personnel without which we could not develop and maintain this nation's leadership in aeronautical and space activities. I do not mean to suggest any general opposition to the established Civil Service system. It is, however, necessary to recognize the need of large scale endeavors to have the means to achieve the flexibility in operation that is so urgently required for success. The "excepted position" is such a means which combines the best of the political appointment and the general schedule structure

without most of the drawbacks of either. Future large scale public endeavors will need this "excepted position" device if the competent men in science, engineering, and administration necessary for success are to be secured from industry and the university campus. Administrators must use the device wisely and as sparingly as possible. They also must avoid systematizing it to a point where control legislation will be invited.

There is another feature of the Space Act of 1958 that I feel has greatly strengthened our capability to secure from the top downward the type of executive leadership and performance that we must have for success in such a large endeavor as the space program. The Act provides for a single Administrator as the final point of decision and responsibility within the Agency and in the Agency's relationships with its environment.

This action of the Congress returned to a basic principle adopted by the Constitutional Convention of 1789. Some delegates to that Convention argued for a collective system for the executive branch, insisting that to entrust vast powers to one man would be a prelude to tyranny. The Convention decided, however, not to repeat the mistake of the Articles of Confederation. It decided upon a President as Chief Executive, and it indicated that departments within the executive branch would be headed by a single "Principal Officer."

A trend away from this principle began with establishment of regulatory and other special agencies in the late nineteenth century. The underlying reasoning was that shared administration as well as regulation is generally considered somehow safer and more trustworthy than administration by one man. You will recall, I am sure, the emphasis given this reasoning when the Atomic Energy Commission was established at the war's end. The atom seemed too powerful an instrument to entrust to a single individual.

The Congress in 1958 felt that the great tasks necessary to achieve U.S. preeminence in space required as efficient and effective an administrative structure as possible. It decided, as had those who drafted the Constitution, that the advantages of one point of final decision outweighed any possible disadvantages, and that our system of checks and balances could be depended upon to prevent abuses.

This has been a most helpful decision for those of us who have had responsibility for the space program. I think it was a very wise decision. The executive working with a large, complex endeavor, whether at the top or in a key position within it, must have for effectiveness the trust and confidence of those for whom he is working -- the President, the Congress, a substantial part of "the public" and his associates. He must be allowed the power to get things done. Decision by committee is under some circumstances a desirable management technique. But for a large scale endeavor where so much is dependent on building and maintaining momentum under conditions of rapid and unpredictable change and great turbulence there must be a single point of final

authority. There should be debate as to course and purposes and ways and means. There must be such debate if the endeavor is to succeed. But when the debate is over and a judgment has been reached someone has to be in a position to act, and act effectively, to implement the decision.

What we have here is a very fundamental thing. I mentioned last week the unease we Americans have always felt in the face of bigness. We have frequently shown distrust of big corporate enterprises. And we constantly voice distrust of big government.

Yet a very simple and basic fact of our life is that we are big. We are a big country; we have big resources at our command; we face big problems and big tasks; we have big opportunities.

Adlai Stevenson spoke of this at a symposium on "Science and Society" which the Xerox Corporation held in 1965. This was, I believe, one of the last major statements Stevenson made before his death. He said that our prowess in science and technology was making the problems and activities with which we are so wrapped up today "irrelevant in the longer run because our economy can grow to meet each new charge made upon it. It will stagnate only if we do not ask enough. This," he added, "is the basic miracle of modern technology. This is why it is, in a real sense, a magic wand which gives us what we desire. Don't let us miss the miracle," he urged, "by underestimating this fabulous new tool. We can have what we want. This is the

astonishing fact of the modern scientific and technological economy. . . This is the new instrument of human betterment that is at our hand if we are ready to take it up."

Stevenson went on to stress, however, that two things are essential if we are to gather the benefits open to us. "The first," he said, "is to recognize that in our modern highly productive market economy, stability and growth depend upon a partnership between management, labor, and government. The second is an end to the quarrel between public and private purposes."

The idea of a conflict between public and private purposes has always struck me as an incongruity in our democracy. It has, however, been a very real thing in our life as a nation. But can we afford to let it continue to be? Instead of concentrating so much of our energies on safeguarding ourselves from ourselves, should we not focus on working out organized ways to do the big things we have to do, organized ways which will have built in safeguards against the possibility of harm to our society?

As I ask this question I sense that I am asking where we are going as a nation, whether we are to amount to new heights or slip into a relentless decline. Here I think we should ponder such thoughts as Dr. Stark Draper passed on to me some time ago. I would like to leave these with you as I conclude the last of these lectures:

"Countries content to maintain static situations that offer no significant challenges may continue to exist without exerting any considerable effort toward improvements. On the other hand, when leadership among well-qualified competitors is involved, the societies concerned must continuously advance the levels of those factors that determine recognition and power on the earth. Unrelenting progress in essential areas is the way of life for any country that aspires to command high levels of respect from friends and enemies. Failure to maintain a competitive state of progess means elimination from the game of political status. Some countries have tried to hold a position of high influence on the basis of an existing but static superior level of ability. The failures of these attempts are recorded many times in the history of mankind. When, for any reasons, a mighty nation has ceased to travel the path of progress, it has always been passed by rivals who continue to strive for advancement in living conditions, economic activity, and military power."